

The Use of Wave-length Rulings as Defining Lines on Standards of Length.

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(Received June 9,—Read June 10, 1909.)

(Abstract.)

The delicacy of the method of measurement in wave-lengths described in the preceding communication calls for a corresponding refinement in the engraved lines, which form the defining lines of the length of a standard yard or metre or other line-measure bar. The defining lines on the Imperial Standard Yard are sharp-edged, but contain the equivalent of 40 interference bands of red light in their thickness, and the Benoît defining lines of the platinum-iridium copy made in 1902 are not only very ragged-edged but contain 15 interference bands in their thickness.

The author has been in communication with Mr. J. H. Grayson, of Melbourne, whose fine rulings have recently evoked such interest among microscopists, and after a long investigation has found that wonderfully satisfactory rulings on the scale of 40,000 to the inch can be made on polished speculum metal, covered with a thin cover-glass. Now the forty-thousandth of an inch is a single wave-length of red light (for $H\alpha = 1/38710$ inch, and Cd red = $1/39459$ inch), so that the interval between any adjacent pair of these lines is equivalent to only two interference bands. The thickness of each line, which is absolutely sharp-edged, is less than a single interference band. The author has therefore devised a defining mark in these rulings, which he terms a "Tutton location signal," to distinguish it from the "Benoît defining line." It consists of five such parallel lines spaced one forty-thousandth of an inch apart, with a pair of strong "finder" lines outside them and parallel to them, and another pair of similar finder lines perpendicularly transverse to them, to indicate a central part of the lines for use. The central line of the five fine Grayson rulings is *the* defining line.

These location signals can also be ruled on platinum-iridium, and with less success on gold and invar. But the result on speculum metal is so very superior that a large number of location signals have been made on this metal by Mr. Grayson for the Standards Department. The paper indicates their possible mode of use, not only as the end-mark defining lines of standard bars, but for a new mode of determining, by a stepping-off process of repeated doublings, the total number of wave-lengths of red cadmium light contained in the British yard.